

CLAIMS

1. In an improved process for producing a composite product, said process comprising:
 - 5 mixing water, gypsum and a cellulosic fiber to form a dilute slurry;
 - heating the slurry, under pressure, to form acicular calcium sulfate alpha hemihydrate crystals;
 - substantially dewatering the hot slurry and shaping the dewatered slurry to form a composite produce before rehydrating the
 - 10 hemihydrate back to gypsum;
 - said improvement comprising adding a crystal modifier to said dilute slurry and heating said slurry at a reduced temperature and/or for a reduced time to form acicular calcium sulfate alpha hemihydrate crystals.
- 15 2. The improved process of claim 1, wherein said crystal modifier selected from the group of aluminum chloride, chlorine, zinc sulfate, iron (III) sulfate, aluminum sulfate hexadecahydrate, iron (II) sulfate heptahydrate, iron (III) sulfate pentahydrate, zinc sulfate heptahydrate, copper sulfate pentahydrate, copper chloride dehydrate,
- 20 manganese sulfate monohydrate and trisodium phosphate.

3. The improved process of claim 1, wherein the amount of crystal modifier is from about 0.05% to about 5% by weight, based on the weight of the gypsum.

4. The improved process of claim 3, wherein the amount of
5 crystal modifier is from about 0.1% to about 1% by weight, based on the weight of the gypsum.

5. In an improved process for producing a composite product, said process comprising:

mixing water, gypsum and a cellulosic fiber to form a dilute slurry;

10 heating the slurry, under pressure, to form acicular calcium sulfate alpha hemihydrate crystals;

substantially dewatering the hot slurry and shaping the dewatered slurry to form a composite produce before rehydrating the hemihydrate back to gypsum;

15 said improvement comprising adding a crystal modifier to said dilute slurry, said crystal modifier selected from the group of aluminum chloride, chlorine, zinc sulfate, iron (III) sulfate, iron (II) sulfate heptahydrate, iron (III) sulfate pentahydrate, zinc sulfate heptahydrate, copper sulfate pentahydrate, copper chloride dehydrate, manganese
20 sulfate monohydrate and trisodium phosphate to increase the aspect ratio of said hemihydrate crystals.

6. The improved process of claim 5, wherein the aspect ratio of said hemihydrate crystals is increase to at least 5:1.

7. The improved process of claim 5, wherein the amount of crystal modifier is from about 0.05% to about 5% by weight, based on
5 the weight of the gypsum.

8. The improved process of claim 6, wherein the amount of crystal modifier is from about 0.1% to about 1% by weight, based on the weight of the gypsum.

9. In an improved process for producing a composite
10 product, said process comprising:
mixing water, gypsum, cellulosic fiber and alum to form a dilute slurry;

heating the slurry, under pressure, to form acicular calcium sulfate alpha hemihydrate crystals;

15 substantially dewatering the hot slurry and shaping the dewatered slurry to form a composite produce before rehydrating the hemihydrate back to gypsum;

said improvement comprising monitoring the aspect ratio of said acicular calcium sulfate alpha hemihydrate crystals,

20 when said monitoring indicates the aspect ratio of said crystals is lower than a first selected value, increasing the amount of alum used to

form said slurry, the amount of alum being sufficient to increase said aspect ratio to no lower than said first selected value; and

when said monitoring indicates the aspect ratio of said crystals is greater than a second selected value, reducing the amount of alum

5 being used to form said slurry, the amount of alum being sufficient to decrease said aspect ratio to no greater than said second selected value.

10. The improved process of claim 9, wherein said first selected value is at least 5:1.

10 11. The improved process of claim 9, wherein said first selected value is at least 10:1.

12. The improved process of claim 9, wherein said second selected value is at least 50:1

13. In an improved process for producing a composite
15 product, said process comprising:

mixing water, alum, gypsum and a cellulosic fiber to form a dilute slurry;

heating the slurry, under pressure, to form acicular calcium sulfate alpha hemihydrate crystals;